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ABSTRACT

The dual conception of literacy as functional knowledge and communication skills has provided the parameters of the debate on computer literacy, which has focussed on what type of knowledge is necessary, and what level, if any, of programming should be taught. These arguments and definitions, however, reflect a particular view of epistemology, pedagogy, the nature of communication, and the role of schooling in relation to the social order. An alternative view of these assumptions implies a markedly different conception of computer literacy. Unlike the dominant functional paradigm, the critical paradigm views knowledge as more subjective, spiritual, and personal; recognizes the learner as an active participant in the production of meaning; and links the possession and creation of knowledge. To empower students to learn in a dialogical relationship with a computer, the only solution compatible with the critical paradigm is to treat the computer as a cultural object for critical reflection. The computer has a place in the curriculum as an object of inquiry in the continual construction of social knowledge. All other conceptions of computer literacy risk assigning consciousness and autonomy to computers, and therefore surrendering our uniqueness as human beings and our quest for the meaning of existence. (LMM)

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COMPUTER LITERACY AND EMPOWERED LEARNING : A THEORETICAL PERSPECTIVE

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Dictionary definitions of literacy generally incorporate the two dimensions of being able to read and write (i.e. communicate), and being knowledgeable or well-informed. These definitions, especially when applied to the notion of universal literacy, have been commonly translated as the minimal amount of knowledge and skills necessary for an individual to function effectively in modern society.

This dual conception of literacy as functional knowledge and (communication) skills has provided the parameters of the debate on computer literacy. In some cases definitions have stressed only one dimension. Computer literacy has been defined as either having (programming) skills, that is "the ability to do computing" (Luehrmann, 1981), or possessing knowledge of computers and/or their social impact (sometimes referred to as "computer awareness"). Other writers have criticized this dichotomy and suggested that both are necessary: "there are two (not just one) generally accepted definitions of literacy", namely "the ability to communicate" and "the state of being informed" (Anderson et al, 1981). These authors examined the literature on computer literacy and noted a continuum ranging from an emphasis on knowledge of programming to an awareness of applications and issues concerning the impact of computers on society. Subsequently they offered their "comprehensive view" in which:

"computer literacy should be thought of as the knowledge and skills the average citizen needs to know (or do) about computers".

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Barger(1983) attempted to unite all perspectives by advocating knowledge of both how computers work ("structure and operation") and their impact on the individual and society ("applications and limitations"), as well as a minimal level of programming skills. His summary of computer literacy definitions illustrates that the debate has been focussed on what type of knowledge is necessary and what level, if any, of programming should be taught.

All these arguments and definitions, however, reflect a particular view of epistemology, pedagogy, the nature of communication, and the role of schooling in relation to the social order. Discussion about these underlying assumptions has been conspiciously absent from the literature on computer literacy. This paper is an attempt to rectify this situation by provoking such a discourse and offering an alternative view of these assumptions. The alternative perspective implies a markedly different conception of computer literacy.

The Dominant or Functional Paradigm

Defining computer literacy on the basis of developing a comprehensive list of performance-based objectives, as undertaken in a project of the Minnesota Educational Computing Consortium (Johnson et al, 1980), legitimatizes one kind of knowledge and skills: that which is discrete, factual and measurable "by explicit and public criteria" (Popkewitz et al, 1982). Burrell and Morgan (1979) have described two opposing views of knowledge. The first view, which is exemplified above, characterizes knowledge as objective, rational

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and truthful (i.e. something to be accepted). This form of knowledge is external to the individual and "capable of being transmitted in a tangible form" to receptive others.

This epistemology leads to a pedagogical perspective of the student as a deficit learner, with classroom instruction following a symbolic abstract or "information assimilation" (Coleman, 1976) learning process. Such a process emphasizes efficiency in mastering knowledge of the past. It relies heavily on students possessing the language skills for encoding abstractions and the ability to transfer symbolic learning into action (Cunningham, 1983). Coleman nominated this dependence on language as the critical problem with the information assimilation method, especially for "subordinate groups within the culture who may lack elaborated language codes" (Cunningham, 1983). Yet computer literacy codes are further removed in abstraction from concrete experiences and action than natural language. So the development of knowledge and skills for understanding and using computers demands a facility with the abstract symbolic mode of thinking.

Ambiguous or problematic knowledge and incidental learning receive no attention in this paradigm. But most significantly, as Freire has criticized, the possession of knowledge is separated from the act of creating knowledge (Mackie, 1981). Not only is the generation of knowledge ignored, but so is "the learning of skills and attitudes appropriate for creating knowledge" (Popkewitz et al, 1982).

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Objective or scientific knowledge and information assimilation learning are predicated solely upon the rhetorical form of communication. The essence of rhetorical communication is transmission of the writer's (or speaker's) structure of reality in a form that can be translated by the reader (or listener) into his/her own framework of reality. In other words, a sender has a message to convey to a receiver. Rhetoric to be communicated must be brought into the individual's consciousness and externalized: a process that implies a conscious control of one's understanding of reality. Computer literacy that involves communication via programming languages requires an even more precise control of one's thought processes.

The paradigms of knowledge, learning and communication discussed to this point share a functional or instrumental purpose. Rationales for computer literacy are highly congruent with the functionality orientation of these paradigms. For example, rationales have exposited the need:

-to improve the nation's economic productivity in the face of foreign competition and "to maintain our national defense" (Deringer & Molnar, 1982);

-for individuals to function "effectively within a given societal role", such as scientists, engineers, managers, students, etc. (Anderson, 1982); and

-for students "to function as contributing members of a modern technological society" (Barger, 1983).

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Furthermore, a computer literacy curriculum based on individuals' societal roles, or "the context in which they handle information", has been proposed (Seidel, 1982). The intention is that "some people need low level understanding (of computers) and others, e.g. students and engineers, need higher level understanding" (Anderson, 1982).

A computer literacy curriculum developed for such instrumental ends has an implicit political agenda, namely to maintain the existing social order and stratify the student population into workforce categories. Social control and cultural transmission, where culture is defined by those having power in society, have been described as a critical role of schools (Young,1971; Bowles & Gintis, 1976; Apple, 1979; Popkewitz, 1983). At the same time it should be recognized that schools are only one part of a larger framework of social structures that reproduce unequal (by class,gender, and race) social relations (Apple,1982). In the past "industrial states have found it prudent to shape the distribution of literacy to their own ends", and supported mass literacy after the industrial revolution to obtain "workers with a greater range of skills for operating the increasingly specialized machine of industrial society" (Marvin & Winther, 1983). Current conceptions of computer literacy maintain this traditional function of schooling.

The Alternative or Critical Paradigm

A second epistemology views knowledge as "more subjective, spiritual ... and essentially personal (in) nature" (Burrell &

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Morgan, 1976). It recognizes the learner as an active participant in the production of meaning. Thus the possession and creation of knowledge are inexorably linked. The multiple construction of social realities is presumed with knowledge being socially constructed from interaction in interpretative communities and from negotiation between teacher and student (Esland, 1971; Belsey, 1980). This view of knowledge has been related historically to literacy: "every measure of literacy ever devised appeals to some criterion of success in interpreting messages, and success in interpreting messages will always be socially constructed rather than an objective category" (Marvin & Winther, 1983).

As social knowledge involves extracting meaning from experience, the pedagogical starting point is a learning process based on experience. Coleman (1976) has advocated an increased emphasis on experiential learning in schools, especially "for students who have limitations in the information assimilation method". At the same time he maintained that eventually students must develop the language skills to participate successfully in the traditional system (Cunningham, 1983). This perspective on experiential learning, however, retains the deficit view of the learner and the legitimation of only knowledge sanctioned by the dominant culture. In both respects it differs from approaches that emphasize social and cultural context.

Freire has stressed that "literacy cannot be viewed in isolation from its social context", which is the "glaring omission in most functional analyzes of literacy"(Mackie, 1981). He added

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that literacy "can serve either to liberate human beings or domesticate them". Interestingly, Barger (1983) acknowledged the relationship of computer literacy to social domination and oppression:

"If a technical elite is not to gain tyranny over the common person ... computer literacy will be essential to human autonomy in the future".

He naively assumed, however, that a "non-technical or low-technical understanding of what computers are and how they work", an understanding of computer applications and limitations, and a minimal level of programming ability "will probably be sufficient" to overcome this threat. This approach ignores the power relationships within society and the plight of students who do not belong to the dominant culture. And, as Marvin and Winther (1983) have pointed out, "the extent to which written literacy is already economically and socially stratified will strongly influence the distribution of computer literacy as well".

The alternative or critical perspective seeks to empower students of the working class or minority groups who are disadvantaged or oppressed. Instead of emphasizing their deficits as learners, it "assumes that problems for individual learners may have their source in the structures of society" (Cunningham, 1983). The approach initially concentrates on students' concrete experiences within their own social and cultural context. An analysis of these experiences is intended to lead to "a heightened social awareness and ability to examine critical issues", often termed "critical

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consciousness" (Cunningham, 1983). Two key features emerge from this approach. First, cognitive skills such as analytical and critical thinking evolve when developed in the context of the student's experiences and examing how power functions in the social system. Second, the development of critical consciousness (concerning social power) demystifies knowledge and schooling and empowers students with control over their own learning. Traditionally schooling delineates who has the knowledge, and what and how that knowledge is to be learned. The critical perspective transforms this situation so that the student holds the power over what and how he/she learns.

Finally, a second form of communication has an important role in the critical paradigms. In contrast to rhetorical communication, expressive communication involves the representation of a person's feelings or ideas in a form that has meaning to the same person. Here the transmitter is the intended primary recipient of the message. Our natural language is a vehicle for expressing and clarifying personal feelings and subjective accounts of reality. Expressive commmunication, using natural language in various forms (including prose, drama, and poetry) or music or painting or other artistic medium, enables us to be interpretive, critical, and even irrational. Computer languages require us to be procedural and scientifically rational - and admittedly enable us to be creative but within syntactical bounds. In other words the computer epitomizes only one kind of rationality, "scientism" or logical empiricism, and excludes kinesthetic, ethical, spiritual, and most aesthetic forms of thought and expression.

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Maxine Greene (1982) has eloquently connected the arts and literacy through the ability of works of art to continually provoke a search for meaning. Works of art, she argued, are generally inexhaustible - no matter how familiar they become - in eliciting interpretation, critical thinking, and reflection; and in providing opportunities to perceive and integrate multiple perspectives of reality. Owing to these characteristics one could add that they can help us confront ambiguity as well as remind us that reality is "the product of individual consciousness" (Burrell & Morgan, 1979). In turn confrontation with ambiguity and "irrational" perceptions of reality illustrate the significant dimensions of our world that we cannot control. Greene did not stop at the experiencing of art and literature but added: students must be encouraged "to express what they see and hear". Such expression, through whatever medium, liberates the individual by giving "public form to private awareness" and simultaneously thwarts both loneliness and powerlessness.

Greene's view of epistemology obviously has much in common with that of Freire. Although a concern for the cultural context of the learner is not shared, her notion of literacy also emphasizes empowered learning and thus unites the critical paradigms:

"Teachers who conceive their students as some plastic material, or some sort of resistant medium, cannot think of empowering students to learn how to learn, to articulate, to be with one another".

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The Critical View of Computer Literacy

Several issues emerge in constructing a conception of computer literacy from the perspective of the critical paradigms outlined. First, as the work of Freire and Greene has indicated, the quest for consciousness and social knowledge or personal meaning involves critical reflection upon and analysis of experiences and actions. These experiences should take place within the context of the student's socio-cultural reality (Freire) or encounters with works of art or literature (Greene). Additionally for both authors, the "act of knowing" and "conscientization" comprises dialogue or expressive communication. Thus the first question must be: How can contextually meaningful experiences and actions with a computer help the student create and express personal meaning and critical consciousness? Second, the development and expression of critical consciousness is intended to liberate ~~the~~ students from domination or powerlessness in social relationships so that they have empowerment over ~~his/her~~ their learning results. This suggests the second essential question: How can the student be empowered to learn in a dialogical relationship with a computer?

While it has been claimed that the computer can provide "a structured set of experiences" (Bork, 1980), these are simulated abstractions of real experiences that can be quantified or visually represented. It should also be remembered that the simulated experiences in instructional software tend not to relate to the everyday experiences of students of subordinate social or cultural groups. Similarly the manipulation of abstractions involved in

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programming requires a high level of language literacy that is often beyond such groups. If these two problems are overcome, then computer-based heuristic strategies, and heuristic languages such as LOGO, may help a student develop a schema for organizing meaningful knowledge and foster a divergent mode of critical thinking (in a performance sense). Computer heuristics, however, cannot create personal meaning or develop critical consciousness.

Perhaps then the second question provides some justification or hope for computer literacy. To Freire the essence of empowered learning is problem posing in which "students are required to examine, to know, and to transform their world, and thus participate in genuine communication" (Mackie, 1981). Posing problems, in these terms, is a semantically demanding activity. Problems posed for examination by computer necessitates their expression in a syntactical, symbolic and quantifiable form with the inherent danger that human problems become reified and divorced from their social and cultural context.

The only apparent solution compatible with the critical paradigms is to treat the computer as a cultural object for critical reflection. In this case the computer, including its social power, is posed as a problem, in an historical and cultural context, requiring cooperative investigation by students and teacher. Watt's (1982) idea of treating the school as a microcosm of society in which students investigate "changes occurring in the social organization of the school" from the introduction of computers could be employed as one part of this approach.

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Only a dialogical relationship between student and teacher can provide the semantic engagement and negogiation essential for the problematizing of one's existential situation and the construction of critical consciousness. The computer, as an increasingly significant part of many students' life experiences, does have a place in the curriculum as an object of inquiry in the continual construction of social knowledge. All other conceptions of computer literacy beyond this one risk assigning consciousness and autonomy to computers, in which case we surrender our uniqueness as human beings and our quest for the meaning of our existence (Weizenbaum, 1976).

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